(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 182 677 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.02.2002 Bulletin 2002/09

(51) Int Cl.[7]: **H01H 25/04**

(21) Application number: **00402340.4**

(22) Date of filing: **23.08.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant: **Thomson Licensing S.A.**
92100 Boulogne-Billancourt (FR)

(72) Inventors:
- **Cui, Wei**
  92100 Boulogne Billancourt (FR)
- **Chan, Yat Fung**
  92100 Boulogne Billancourt (FR)

(74) Representative: **Bonnans, Arnaud et al**
Thomson multimedia 46, quai Alphonse Le Gallo
92648 Boulogne Billancourt Cedex (FR)

(54) Electronic switch designed for manual actuation of several switching elements

(57) Within electronic devices in many cases there exists a need for a manual individual actuation of several switching elements for performing an adjustment of different parameters by a single switch, especially for a pleasure appearance of a front panel and for saving place on the panel.

It is an object to provide a switch for this purpose ensuring among others low costs, small size, high reliability, convenient actuation and having good properties for being mounted on a printed circuit board.

The actuation means for several switching elements (16) includes an undivided rectangular plate (6) being pivotably mounted in a housing member (1) of the switch and a push-button (21) located within a central opening (8) of said plate (6).

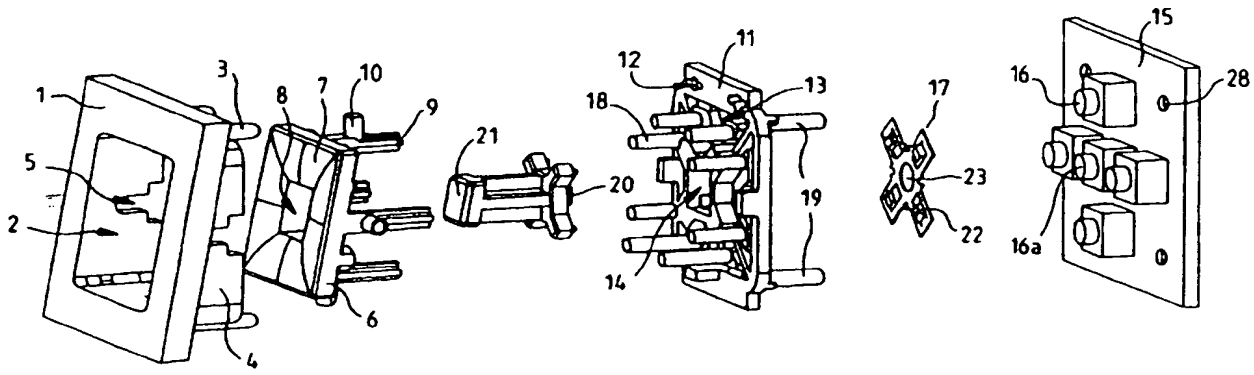

FIG.1

EP 1 182 677 A1

Description

[0001] The invention relates to an electronic switch designed for manual actuation of several switching elements.

[0002] Within electronic equipments including a high number of controllable or adjustable elements and a corresponding high number of operating elements like push-buttons, knobs, shiftable elements etc., a need exists for actuating several functions by means of a single switch. This is the case especially for improving the optical appearance of a control panel and to reduce the space occupied by the operating elements on the surface of the control panel.

[0003] Practically there exists a number of requirements for such multifunction switches. Some of them are among others low costs, small size, high reliability and good properties for being mounted on a printed circuit board (PCB).

[0004] It is an object of the present invention to provide a multifunction switch meeting said requirements in a more extended form than switches according to prior art.

[0005] The invention proposes an electronic switch adapted for an individual actuation of one of a plurality of switching elements including a housing and manual actuation means mounted in said housing and being pivotable about an axis for individually actuating said several switching elements. Said actuation means includes an undivided rectangular plate being pivotably mounted in a housing member of the switch and a push-button located within a central opening of said plate.

[0006] Preferably said plate is mounted in said housing member pivotably about two axes lying in a perpendicular relation to each other. This feature enables the individual manual actuation of four separate switching elements by pressing the upper part, the right part, the lower part or the left part of the surface of the plate. Said plate may include a number of slightly curved convex partial areas each area being adapted to pivot the plate in different directions. The plate may have the form of an undivided doughnut shaped button.

[0007] According to one embodiment of the invention said plate is provided at each of its sidewalls with a pin, each pin cooperating with a slot or a hole within said housing member for enabling said pivoting movement of the plate about two perpendicular axes. Furthermore said plate is provided at its rear side with four rods extending perpendicular to the plane of said plate into the interior of the housing and abutting against movable parts of the switching elements located at the back side of said housing. Said pins may form an integral part of said rods.

[0008] According to a further embodiment of the invention the housing of the switch includes between said plate and said switching elements a guiding plate with a central opening acting as a guidance for said push-button and four openings provided for the passage of said rods. Therein the guiding plate carries at its first surface a number of rods abutting against said housing member and at its opposite surface a number of rods abutting against said switch panel.

[0009] According to a further development of the invention said housing member forms an integral part of a cabinet of a device like a CD-player and the switch panel forms an integral part of a printed circuit board located within said cabinet.

[0010] According to a further development of the invention several push-buttons are located in several openings of the plate side by side or one above the other whereby the number of the individually actuable switching elements can be further increased.

[0011] As the undivided plate is pivotable about two perpendicular axes in each case in two different directions so that that totally the plate can be pivoted in four different directions it can be used for example to move a cursor on a screen in four perpendicular directions, i. e. to any desired point on the screen, especially for navigation purposes. The arrangement of the plate and the central button according to the invention allows the individual manual actuating of any one of five separate switching elements or tact switches by a single switch.

[0012] The switch according to the invention offers a number of advantages. A high cost saving is achieved as five switching elements or functions can be actuated individually by one switch only instead of a conventional multidirectional switch. Additionally a space saving is achieved as the arrangement according to the invention facilitates the manufacture of more compact and light units. Especially high density mounting on a printed circuit board (PCB) is permitted and low profile and light weight are realized greatly. Furthermore appearance simplicity with web feeling and stylish high class image are achieved compared with conventional segmental style design. Switch mechanism and contact structure offer the best panel design flexibility. Less fastening means enables an easy assembling. Internal isolated momentary mechanism and contact structure make the structure more tolerant to the warping of a PCB.

[0013] The switch according to the invention provides a high number of different advantageous applications. For example it can be used for the operation and setting of data input equipments, especially pointing devices such as mouse and micro trackball, and communication equipments. Another application are devices using micro switches as operating switches in different electronic apparatus. It may be applied in car audio systems, car navigation systems, for adjusting the side mirror in an automobile, furthermore for cursor control of a graphic input device and audio devices such as equalizers. Finally it can be used for operating various adjustments for such items, especially for portable electronic equipments. Further possible fields of application may be all types of audio products, business machines, communication equipments, measuring instruments, television receivers, video recorders, in particular in compact ver-

sion requiring high density mounting such as cellular phones.

[0014] One embodiment of the invention will now be described with reference to the accompanying drawing. Within the drawing

Fig. 1 shows all elements of a switch according to the invention in an exploded view,
Fig. 2 is a perspective view of a housing member of the switch,
Fig. 3 is a perspective view of an actuating plate shown in Fig. 1,
Fig. 4 is a guiding plate provided for guiding the rods of the operating plate and the push-button and
Fig. 5 is a spring plate for actuating the switching elements.

[0015] Fig. 1 shows a housing member 1 of a switch including a rectangular opening 2, four rods 3 at the rear side and four sidewalls 4 at the rear side each provided with a slot 5. A rectangular actuating plate 6 with the dimensions of the opening 2 includes several slightly curved surface areas 7, a central opening 8, four rods 9 extending from the rear side and each provided with a pin 10 directed perpendicular to the rods 9. The actuating plate 6 is inserted into the opening 2 of the housing member 1, the four pins 10 cooperating with the slots 5. In this way the operating plate 6 can pivot within the housing member 1 in both directions about a horizontal axis defined by two opposite pins 10 and about a vertical axis defined by the other two opposite pins 10.

[0016] Furthermore a push-button 21 having a foot part 20 is provided which fits into the central opening 8 of the actuating plate 6.

[0017] Next a guiding plate 11 is provided including four holes 12 at its upper and lower border aligned with the rods 3, four openings 13 aligned with the rods 9 and a central rectangular opening 14 aligned with the push-button 21. The rods 3 of the housing member 1 are inserted into the holes 12 so that the housing member 1 and the guiding plate 11 are firmly combined and from a rigid structure. Rods 18 of the guiding plate 11 abut against the housing member 1 whereas four rods 19 of the guiding plate 11 are inserted into four holes 28 of a switch panel 15 provided at the right end of the structure.

[0018] The switch panel 15 carries at its surface five switching elements 16 in the arrangement shown. Between the guiding plate 11 and the switch panel 15 a spring plate 17 is provided with four spring-like members 22 aligned with the rods 9. A hole 23 within the spring plate 17 enables the passage of the foot part 20 of the push-button 21 for actuating the central switching element 16a.

[0019] In the following the operation of said switch will be described. For actuating one of the switching elements 16 the operator pushes or presses the upper part, the right part, the lower part or the left part of the plate 6 or the push-button 21 so that the corresponding switching element 16 on the switch panel 15 is actuated by one of the rods 9 or the foot part 20 of the push-button 21. Thus the separated switching elements 16 can be actuated by an operator individually only by said single plate 6 and the push-button 21.

[0020] The housing member 1 may be an integral part of the cabinet of a CD player whereas the switch panel 15 may be mounted on a printed circuit board mounted within said cabinet. The other elements like elements 6, 21, 11, 17 are inserted during the assembling of cabinet and printed circuit board.

[0021] Fig. 2 shows the housing member 1 from the rear side with the four sidewalls 4 each including a slot 5 and the central opening 2 for receiving the rectangular plate 6 of Fig. 1 as well as the four rods 3 being inserted into the holes 12 of the guiding plate 11 according to Fig. 1.

[0022] Fig. 3 shows the actuating plate 6 from the rear side including the four rods 9 abutting against the switching elements 16, the four pins 10 forming an integral part with the rods 9 and cooperating with the slots 5 in Fig. 1 and 2 as well as the central opening 8 for receiving the push-button 21.

[0023] Fig. 4 shows the guiding plate 11 from the right side in Fig. 1 including the four rods 19, the four openings 13 for the passage of the four rods 9 and the central opening 14 acting as a guidance for the push-button 21.

[0024] Fig. 5 shows the spring plate 17 including four spring elements 22 being interposed between the ends of the rods 9 and the corresponding four switching elements 16 of the switch panel 15 for ensuring a sudden actuation of the switching elements 16 by the rods 9.

Claims

1. Electronic switch designed for an individual actuation of one of a plurality of switching elements including a housing and manual actuation means mounted in said housing and being pivotable about an axis for individually actuating said several switching elements,
characterized in that
said actuation means includes an undivided rectangular plate (6) being pivotably mounted in a housing member (1) of the switch and a push-button (21) located within a central opening (8) of said plate (6).

2. Switch according to claim 1,
wherein said plate (6) is mounted in said housing member (1) pivotably about two axes lying in a perpendicular relation to each other.

3. Switch according to claim 1,
wherein said plate (6) includes a number of slightly curved convex partial areas (7).

4. Switch according to claim 3,

wherein said plate (6) has the form of an undivided doughnut shaped button.

5. Switch according to claim 1, wherein said plate (6) is provided at each of its sidewalls with a pin (10), each pin cooperating with a slot (5) or a hole within said housing member (1) for enabling said pivoting movement of the plate (6) about two perpendicular axes.

6. Switch according to claim 1, wherein said plate (6) is provided at its rear side with four rods (9) extending perpendicular to the plane of said plate (6) into the interior of the housing of the switch and abutting against movable parts of the switching elements (16) of a switch panel (15) located at the back side of said housing.

7. Switch according to claim 5 and 6, wherein said pins (10) form an integral part of said rods (9).

8. Switch according to claim 1, wherein the housing of the switch includes between said plate (6) and said switching elements (16) a guiding plate (11) with a central opening (14) acting as a guidance for said push-button (21) and four openings (13) provided for the passage of said rods (9).

9. Switch according to claim 8, wherein the guiding plate (11) carries at its first surface a number of rods (18) abutting against said housing member (1) and at its opposite surface a number of rods (19) abutting against said switch panel (15).

10. Switch according to claim 1, wherein said housing member (1) forms an integral part of a cabinet of a device and the switch panel (15) forms an integral part of a printed circuit board located within said device.

11. Switch according to claim 1, wherein several push-buttons (21) are located in several openings (8) of the plate (6) side by side or one above the other.

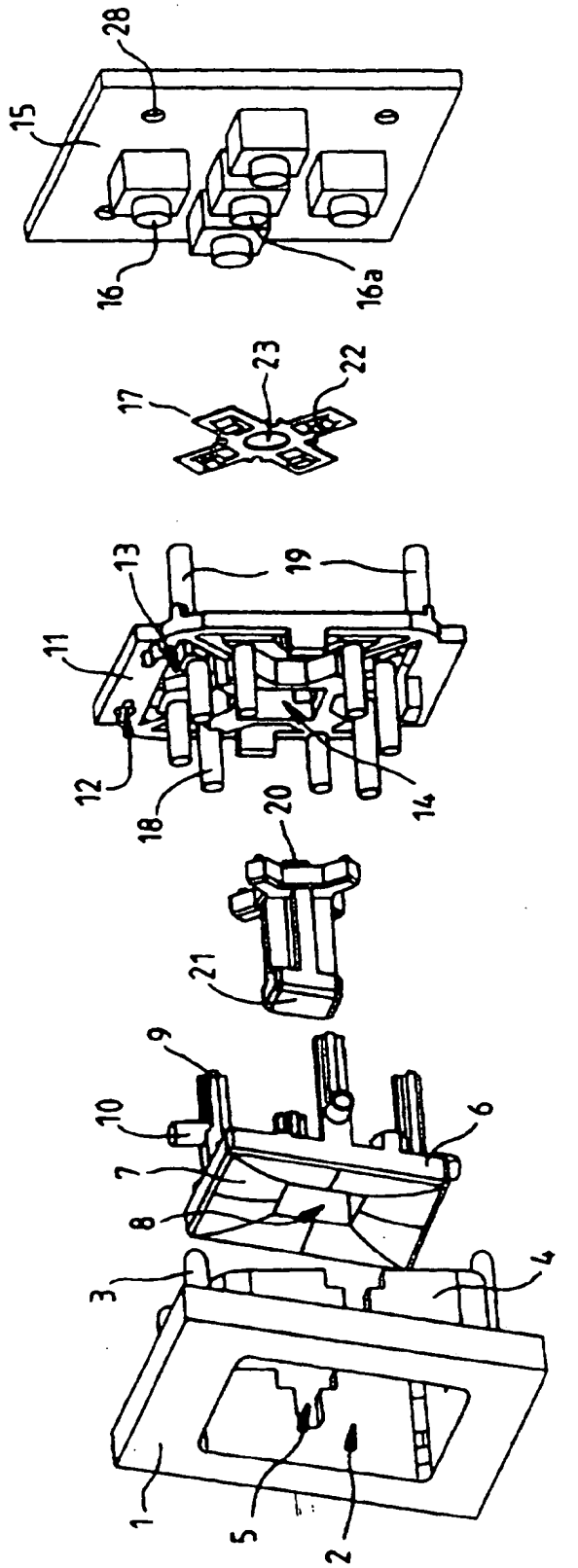

FIG.1

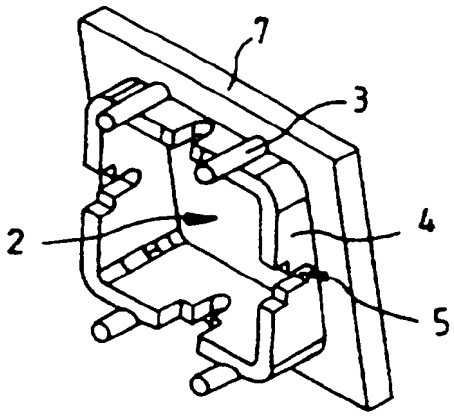

FIG.2

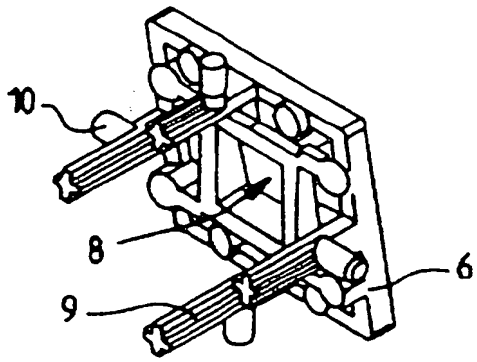

FIG.3

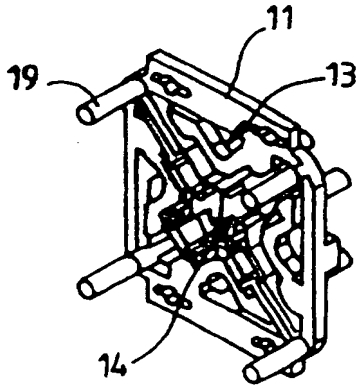

FIG.4

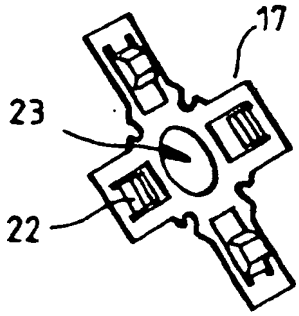

FIG.5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 40 2340

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DE 92 10 286 U (BLAUPUNKT-WERKE GMBH) 24 September 1992 (1992-09-24) * the whole document *	1-4,6,7, 10	H01H25/04
X	EP 0 587 406 A (MATSUSHITA ELECTRIC IND CO LTD) 16 March 1994 (1994-03-16) * column 9, line 33 - column 10, line 10; figures 9,10 *	1,4,6,7	
A	US 4 947 461 A (YOSHIOKA TOSHIO ET AL) 7 August 1990 (1990-08-07) * column 3, line 23 - line 44; figures 1,2 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 January 2001	Ramírez Fueyo, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 40 2340

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-01-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 9210286 U	24-09-1992	NONE	
EP 0587406 A	16-03-1994	JP 6089636 A	29-03-1994
		JP 3010938 B	21-02-2000
		JP 6139879 A	20-05-1994
		DE 69315149 D	18-12-1997
		DE 69315149 T	07-05-1998
		KR 137262 B	15-06-1998
		KR 162913 B	15-01-1999
		US 5430262 A	04-07-1995
US 4947461 A	07-08-1990	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82